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U. S. DEPARTMENT OF AGRICULTURE - FOREST SERVICE
CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
Division of Forest Insect Research

FOREST INSECT CONDITIONS
UPPER TUOLUMNE RIVER DRAINAGE, YOSEMITE NATIONAL PARK
FALL 1955
APPRAISAL SURVEYS

INTRODUCTION

Epidemics of the lodgepole needle miner, Recurvaria milleri Busck, and the mountain pine beetle, Dendroctonus monticolae Hopk., in lodgepole pine stands, continue to prevail in the high valleys of northeastern Yosemite National Park. Population surveys to determine the abundance of the needle miner were made in the spring and in the fall, and an aerial appraisal of needle miner damage was made in August. An appraisal survey of the mountain pine beetle infestation was made in September to determine the extent and degree of damage caused by this insect. These surveys were conducted by various members of the Division of Forest Insect Research, as noted below.

LODGEPOLE NEEDLE MINER

In 1955, for the third consecutive year, the lodgepole needle miner outbreak in Yosemite National Park was the most extensive single insect infestation in California. The outbreak covered about 45,000 acres. The most serious centers of infestation in 1955 were in Conness, Alkali, Cathedral, Dingley, and Delaney Basins.

In late June, collections of four random tips were made by G. L. Downing and R. E. Stevens from 50 trees each, in the Tenaya, Delaney, Youngs, and Conness areas, to sample populations and defoliation. The June collection of tips indicated that the populations of needle miner and associated defoliation were little changed from 1953.

On August 4, an aerial survey of the outbreak was made by Downing and G. C. Trostle in a rented Cessna 180 airplane flown by a U. S. Forest Service pilot. The observers spent approximately 3 hours of survey time over the needle miner-infested area, sketch-mapping the extent and relative intensity of defoliation. Needle miner defoliation was very heavy in Alkali, Conness, Dingley, and Delaney Creeks, but only slight changes in the infested area were detected, as indicated on the overlay at the end of this report. Some differences in the intensity of the infestation as compared to 1954 were noted, but these are not thought to be significant. There was some indication that the needle miner alone is killing trees, but the extent of tree mortality due to this insect is difficult to determine accurately. During the course of the mountain pine beetle survey, described below, some trees

with no evidence of beetle attack were found to be dead, probably as a result of defoliation. However, a quantitative estimate of killing due to the needle miner was not made.

In October, G. R. Struble made collections of tips from a number of areas to sample the first instar larval populations. The October sampling of tips showed a heavy population persisting in most of the previously heavily defoliated areas, with indications of heavy populations starting in the Tuolumne Meadows area. Large numbers of needle miner adults were seen this summer for the first time in this area.

MOUNTAIN PINE BEETLE

The survey of the mountain pine beetle infestation was made during the second week of September by a party consisting of R. C. Hall, G. C. Trostle, G. L. Downing, R. E. Stevens, D. S. Meyer, and H. E. Waksdal. On September 8, the survey party walked from Tuolumne Meadows to a campsite on Alkali Creek, some eleven miles distant. Supplies and equipment were taken in by a packer and stock was furnished by the National Park Service. The packer also went in to the campsite on September 12 and returned the equipment to Tuolumne Meadows.

INFESTATION AREA

The mountain pine beetle infestation occurs in remote, rugged country, making access and appraisal relatively difficult. The principal areas infested lie in the upper reaches of two tributaries of the Tuolumne River -- Alkali Creek and Conness Creek. Alkali Creek was referred to previously as McCabe Basin.1/ The name is changed here inasmuch as there is a broad uninfested area directly below the McCabe Lakes which might be mistakenly identified as the infested area, on down Alkali Creek. The more descriptive area name, Alkali Creek, will henceforth be used.

There are certain differences in the Alkali, Conness, Dingley, and Delaney drainages that are worth mentioning, as they undoubtedly have an effect upon the characteristics of the mountain pine beetle infestation, and also influence control considerations. Alkali and Conness Creeks comprise some of the uppermost reaches of the Tuolumne watershed and are in deep canyons. Dingley Creek is separated from Delaney Creek by a low, gentle ridge, and there is similarly gentle topography separating Delaney Creek from Tuolumne Meadows.

The timber type in the Alkali and Conness bottoms is nearly pure lodgepole pine, which gives way on some of the higher slopes and the ridges to mountain hemlock. Mountain hemlock is not attacked by mountain pine beetle. Fingers of lodgepole pine connect the Alkali and Conness drainages; therefore, even though the terrain probably presents some barrier to beetle spread, the continuous strips of susceptible trees prevent any real isolation of either of the drainages. Between Conness and Dingley Creeks, the terrain is similarly

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1/ Downing, G. L. Forest Insect Conditions, Conness Basin, Yosemite National Park, September 1954, Appraisal Survey. C.F.& R.E.S., Berkeley, Calif., Sept. 17, 1954.

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rugged, but the mountain hemlock stand on the ridge appears to allow no union of the pines on the Conness bottom with those in Dingley Creek. Lodgepole pine is continuous throughout both Dingley and Delaney Creeks and on into Tuolumne Meadows.

SURVEY METHODS

Lines of 1/4-acre circular plots, spaced at 10-chain intervals, were run throughout the infestation areas. Plot centers were at 5-chain intervals. The lines were drawn on maps in camp, but were occasionally modified in practice when they ran out of type. Under these circumstances the cruiser merely offset on another bearing in order to remain in the pine stand. A total of 556 plots were cruised, giving in the neighborhood of a 2 percent sample. All currently infested trees 6 inches in d.b.h. or larger were tallied.

STATUS AND SCOPE OF INFESTATION

The mountain pine beetle infestation has expanded considerably since 1954. Then, the infested area in Conness was estimated to be 750 acres, and for Alkali Creek, about 900 acres. These two infestations have now joined and it is estimated that there are 5,400 acres that are heavily infested in the combined area. In addition, a moderate infestation of some 500 acres (see map) was discovered in Dingley Creek, the next drainage south from Conness toward Tuolumne Meadows. No important mountain pine beetle loss was seen in Delaney Creek or in Tuolumne Meadows. The Rodgers Canyon infestation area was not surveyed this season.

The results of the cruise are shown in the following table:

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Area	Acreage	Average number of infested trees per acre	Estimated number of infested trees in the area
Alkali-Conness	5,400	8.9 ± 0.49	48,060 ± 2,646
Dingley	500	0.24 ± 0.09	120 ± 45

Following is a breakdown, by diameters, of currently infested trees tallied on the 556 1/4-acre circular sample plots:

DBH	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46
No. Trees:	2	12	15	25	61	96	113	107	60	107	91	50	35	29	21	17	14	8	6	2	2

The average d.b.h. for the entire sample of 873 trees is 24 inches.

Progress of the mountain pine beetle infestation in Conness Basin is shown in the following table:

	No. trees per acre	Av. diameter (inches)	Percent of 1952 green stand killed (trees)
Green stand 1952	46.6	19	0
Infested 1952	2.8 ± 0.40	21	6.0
Infested 1953	4.1 ± 0.55	23	8.8
Infested 1954	5.3 ± 0.51	20	11.3
Infested 1955	8.9 ± 0.49	24	19.1
Total infested and dead	21.1	21	45.3

DISCUSSION

It is strikingly apparent in the needle miner-mountain pine beetle complex that the former insect is the more important. The indications are that if the needle miner can be controlled the mountain pine beetle problem will lose its significance.

An attempt to control the needle miner in the Tuolumne Meadows-Tenaya Lake area by the aerial application of DDT failed to produce satisfactory results in 1953. The ineffectiveness of the treatment apparently was due to the fact that the insecticide did not reach the insect in large enough quantities to be toxic. Small-scale tests conducted by G. R. Struble in 1954 and 1955 showed that malathion has real promise for controlling the needle miner. In these tests, malathion proved to be the most effective of several insecticides tried. This chemical appears to be far more deadly to the insect than DDT, and less toxic to fish and wildlife. Field trials of malathion are now needed to determine the practicability of using this insecticide in a large-scale control operation.

The data obtained in the appraisal of the mountain pine beetle indicate that there are now about 48,000 trees currently infested in the Conness and Alkali Creek Basins. During the past 4 years, nearly 50 percent of the stand in these areas has been killed, and in local spots every tree has been killed. The infestation has now progressed to the point where it seems hopeless to attempt control; it is very nearly certain that the stands in Conness and Alkali Creeks are developing into another "ghost" forest. Since these areas are in the little-used back country, the impact on recreational use may not be too serious. However, the infestation appears to be progressing toward Tuolumne Meadows and it poses a serious threat to extensive stands of lodgepole pine in this high-use area.

No serious infestations of the mountain pine beetle were observed in Delaney or Tuolumne Meadows. In Dingley Creek, however, the mountain pine beetle infestation is just starting, although the overall area infested is small. Should this center enlarge, there is no high ridge and no change of timber type separating it from Delaney Creek and thence from Tuolumne Meadows. Although the green trees are currently being weakened by the needle miner, an effective program of mountain pine beetle control should keep the infestation from spreading into Delaney Creek and Tuolumne Meadows until such time as the needle miner outbreak declines or control becomes possible.

If the National Park Service considers that steps should be taken to control the lodgepole needle miner and mountain pine beetle in the vicinity of Tuolumne Meadows, we suggest the following action:

1. In cooperation with the Experiment Station, undertake in the spring of 1956 a pilot-plant type of control operation against the lodgepole needle miner to determine the practical value of malathion for controlling this insect.

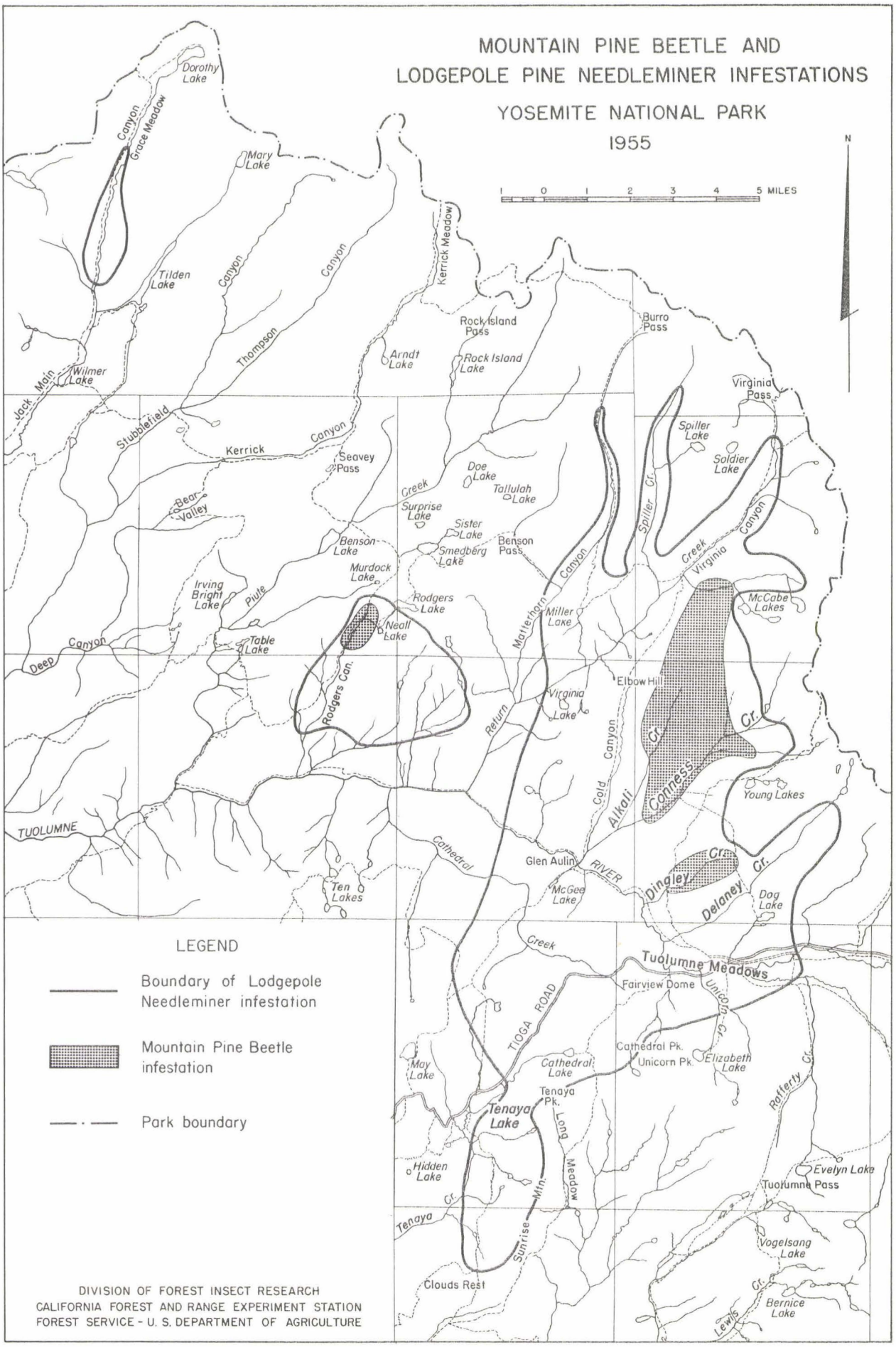
2. Initiate in early summer of 1956 a direct control program, using ethylene dibromide to treat mountain pine beetle broods in infested trees in Dingley Creek.

3. Carry on maintenance control work against the mountain pine beetle in Dingley Creek and areas in the immediate vicinity of Tuolumne Meadows until the needle miner epidemic is reduced.

4. Continue surveillance of other needle miner-infested areas.

Berkeley, California
December 7, 1955

Robert E. Stevens,
Ralph C. Hall,
Entomologists


MOUNTAIN PINE BEETLE AND
LODGEPOLE PINE NEEDLEMINER INFESTATIONS
YOSEMITE NATIONAL PARK
1955
N
0 1 2 3 4 5 MILES
Dorothy Lake
Grace Meadow Canyon
Mary Lake
Tilden Lake
Canyon
Thompson Canyon
Kerrick Meadow
Rock Island Pass
Burro Pass
Arndt Lake
Rock Island Lake
Wilmer Lake
Jack Main Canyon
Stubblefield Canyon
Kerrick Canyon
Seavey Pass
Virginia Pass
Spiller Lake
Soldier Lake
Spiller Cr.
Doe Lake
Tallulah Lake
Bear Valley
Surprise Lake
Creek
Sister Lake
Smedberg Lake
Benson Lake
Benson Pass
Murdock Lake
Irving Bright Lake
Piute Canyon
Rodgers Lake
Neall Lake
Table Lake
Deep Canyon
Rodgers Can.
Matterhorn Canyon
Miller Lake
Virginia Creek
McCabe Lakes
Elbow Hill
Virginia Lake
Return Cr.
Cold Canyon
Alkali Cr.
Cathedral Cr.
Young Lakes
TUOLUMNE
Cathedral Creek
Glen Aulin
RIVER
McGee Lake
Ten Lakes
Dingley Cr.
Delaney Cr.
Dog Lake
Tuolumne Meadows
Fairview Dome
TIOGA ROAD
Unicorn Cr.
May Lake
Cathedral Lake
Cathedral Pk.
Unicorn Pk.
Elizabeth Lake
Rafferty Cr.
Tenaya Pk.
Tenaya Lake
Long Meadow
Hidden Lake
Evelyn Lake
Tuolumne Pass
Tenaya Cr.
Sunrise Mtn.
Vogelsang Lake
Clouds Rest
Lewis Cr.
Bernice Lake
LEGEND
Boundary of Lodgepole Needleminer infestation
Mountain Pine Beetle infestation
Park boundary
DIVISION OF FOREST INSECT RESEARCH
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